

**REMARKS**

No claims are added or canceled. Claims 1, 10 and 20 are amended. The amendments to the claims are fully supported by the specification as filed. Claims 1-4, 6-13 and 15-20 are currently pending.

The pending claims are rejected under 35 U.S.C. 103 as unpatentable over US 3,852,999 to Wright in view of US 6,624,539 to Hansen in further view of US 4,845,450 to Porzio.

Rejection of claims 1-4, 6-13 and 15-19

Claims 1-4, 6-13 and 15-19 are rejected as an obvious combination of Wright, Hansen and Porzio. The Examiner cites Porzio for disclosure of the giant magnetostrictive element recited in independent claims 1 and 10.

As a predicate to consideration of claims 1-4, 6-13 and 15-19:

Independent claim 1 recites, in pertinent part, a bonding apparatus comprising: "a bonding tool coupled to an ultrasonic transducer, said ultrasonic transducer comprising:...a magnetic circuit for channeling the magnetic fields in the giant magnetostrictive element, wherein said giant magnetostrictive element is a composite comprising two or more rare-earth-based *giant magnetostrictive alloy parts* separated from one another *only* by a layer of passive polymeric material.

Independent claim 10 recites, in pertinent part, a bonding apparatus comprising: "an ultrasonic transducer...comprising a giant magnetostrictive element...wherein the giant magnetostrictive element is a composite comprising two or more rare-earth-based *giant magnetostrictive alloy parts* separated from one another *only* by a layer of passive polymeric material."

Independent claims 1 and 10 now recite that giant magnetostrictive element comprises at least two individual *giant magnetostrictive* alloys separated from one another *only* by a layer of passive polymeric material. In contrast, Porzio only discloses and suggests interlacing discs of magnetostrictive material

with disks of unmagnetized Samarium-Cobalt (Sm-Co) and separating the magnetostrictive discs from the Samarium-Cobalt discs with layers of epoxy. Consequently, while Applicant does not agree that it is obvious to substitute giant magnetostrictive material for magnetostrictive material, Porzio still fails to teach or suggest layers of magnetostrictive material separated *only* by a polymeric material, such as epoxy. Porzio teaches further separation by layers of Samarium-cobalt.

Additionally, Porzio fails to disclose giant magnetostrictive material such as Terfenol-D. Magnetostrictive material is one that changes shape when subjected to a magnetic field (i.e., "magnetostrictive strain"). A "giant" magnetostrictive material exhibits magnetostrictive strain in the range of *thousands of parts-per-million*.

For example, transition metals such as iron, cobalt and nickel exhibit magnetostrictive strains in the order of *tens of parts-per-million*. Unlike Terfenol-D, such magnetostrictive materials are unsuitable for ultrasonic applications.

Samarium-cobalt, as disclosed in Porzio, is not a magnetostrictive material, and clearly not a *giant* magnetostrictive material. Rather Samarium-cobalt is a permanent magnet with high permeability. However, due to its internal material formation and stability, Samarium-cobalt exhibits no magnetic field induced mechanical strains.

Further, Porzio teaches employing unmagnetized Samarium-cobalt (see col. 5, lines 38-39). Thus the Samarium-cobalt utilized is not even a permanent magnet. It is a passive material exhibiting no magnetic properties whatsoever. In short, the Samarium-cobalt employed in Porzio has completely different properties from the giant magnetostrictive materials claimed herein. Consequently, it would not have been obvious to substitute a layer of giant magnetostrictive material for a layer of Samarium-cobalt as taught by Porzio to reach the claimed invention.

For these reasons, even if it were obvious to combine the cited references, the Wright-Hansen-Porzio combination fails to teach or suggest each and every element of independent claims 1 and 10. Claims 2-9 and 11-19 depend from claims 1 and 10 and are therefore also allowable.

#### Rejection of claim 20

Independent claim 20 is also rejected as obvious over Wright in view of Hansen in view of Porzio. In response, Applicant has amended claim 20 to more clearly distinguish the claimed invention from the cited combination of references. The claim 20 amendment is supported by the specification at, for example, page 9, line 17 and Figure 3.

Amended claim 20 recites, in pertinent part, a bonding apparatus comprising:

*"a pair of permanent magnets surrounding the supporting member, one of the pair of permanent magnets located at the first end of the giant magnetostrictive element and the other one of the pair of permanent magnets located at the second end of the giant magnetostrictive element..."*

In contrast to the claim 20 recitation, Hansen discloses an ultrasonic transducer with a *single* permanent magnet (see Figure 4, reference numeral 71) that *surrounds* the magnetostrictive element (ref. numeral 42) and coil (ref. numeral 51). At all times, Porzio's single permanent magnet is only on one side of the magnetostrictive element.

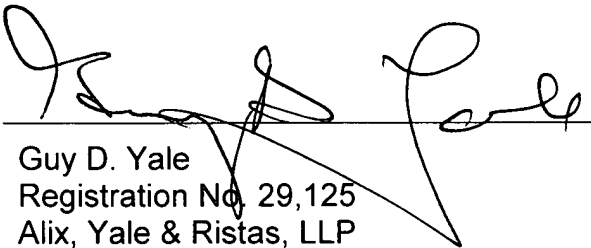
Neither Wright nor Porzio disclose or suggest a pair of permanent magnets, one on each side of a magnetostrictive element. Consequently, even if it were obvious to combine Wright, Hansen and Porzio, the combination does not teach or suggest each and every element of claim 20 and claim 20 is allowable.

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In view of the foregoing, the cited combination of references does not render claims 1-4, 6-13 and 15-20 unpatentably obvious. For these reasons, Applicant respectfully requests that the Examiner withdraw his rejections and pass the pending claims to issue.

Respectfully Submitted,

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